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THE EFFECTIVENESS OF SELF INSTRUCTION IN TEACHER EDUCATION USING MODELLING AND VIDEO TAPE FEEDBACK.

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TO COMPARE MODES OF TRAINING TEACHERS IN THE LECTURING SKILL OF REDUNDANCY WITHOUT USING DIRECT SUPERVISORY-TEACHER CONFERENCES, 94 TEACHER INTERNS WERE RANDOMLY GROUPED FOR SIX EXPERIMENTAL TREATMENTS. A RECORDING OF THE INTERN'S CLASSROOM PERFORMANCE WAS FOLLOWED TWICE BY A TRAINING SESSION AND ANOTHER RECORDING. TREATMENTS WERE--VIEWING A MODEL PERFORMANCE BY AN EXPERIENCED TEACHER WITH AND WITHOUT CONCURRENTLY RECORDED ("CONTINGENT") COMMENTS ABOUT THE SKILL, VIEWING SPECIFIC ILLUSTRATIONS OF REDUNDANCY OUTSIDE A LESSON CONTEXT, AND VIEWING AN INTERN'S OWN TAPED PERFORMANCE WITH AND WITHOUT CONTINGENT COMMENTS RECORDED BY THE EXPERIMENTER. ANALYSIS OF COVARIANCE WAS PERFORMED ON SCORES OBTAINED BY OBSERVATION OF 19 DIFFERENT PERFORMANCE VARIABLES REGARDING VISUAL HIGHLIGHTS AND VERBAL REDUNDANCY. RESULTS INDICATED THAT SPECIFIC ILLUSTRATIONS WERE NOT AS EFFECTIVE ALONE AS WHEN THEY WERE COMBINED WITH A CONTINGENT FOCUS, ESPECIALLY FOR VISUAL HIGHLIGHTING EFFECTS WHERE THE RANGE OF EXAMPLES IS GREATER. ALTHOUGH STRONG TRENDS SHOWED THAT VIEWING ONE'S OWN PERFORMANCE WITH A CONTINGENT FOCUS WAS MORE EFFECTIVE THAN WITH A NONCONTINGENT FOCUS, FURTHER INVESTIGATION MUST ACCOUNT FOR VARIATIONS IN LECTURE CONTENT AND EFFECTIVENESS OF DIFFERENT MODELS FOR DIFFERENT TEACHING SKILLS. THIS PAPER WAS PRESENTED AT THE AMERICAN EDUCATIONAL RESEARCH ASSOCIATION ANNUAL MEETING (CHICAGO, FEB. 7-10, 1968). (LH)

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THE EFFECTIVENESS OF SELF-INSTRUCTION IN TEACHER EDUCATION USING MODELLING AND VIDEO-TAPE FEEDBACK

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The purposes of this study are: (1) to appraise the relative effectiveness of fifteen modes of training teachers in specific teaching skills without direct supervisor-teacher conferences; (2) to determine the effectiveness of recorded supervisory comments on an audio-visual (video-tape) recording of a teacher's own performance; (3) to determine the effectiveness of various protocols for modeling teaching skills and various modes of focusing a teacher's attention on the skill demonstrated.

"Who shall be responsible for the supervision of the classroom teacher?" has long been a controversial question. The school administrator has often been labeled as a "snoopervisor" rather than one who is interested in helping the teacher to improve his performance. Teachers are critical of administrators who supervise instruction in fields other than the one(s) in which they are credentialled to teach. Also, administrators claim that demands on them are so great for other matters that little time remains for giving attention to the improvement of instruction and, yet, supervision is their main responsibility.

Those responsible for supervising trainees during pre-session training also complain of similar problems. The frequency and extent of supervision are often limited due to the large number of trainees assigned per supervisor and the distant location of many of the cooperating schools. Senior professors find little time to supervise teachers in training so it is typically relegated to the most junior members or to graduate students.

With the advent of the portable television recorder, it is possible to record a trainee teacher in the school and bring the tape back to the campus for critique, resulting in considerable economy in the use of senior staff time. At the

same time, the logistical problem of coordinating teacher and supervisor time can be simplified. This technique will also provide one solution to the supervisory problem in elementary and secondary schools discussed above. One professor can now critique the performance of several teachers in less time than he would spend travelling to even one school. Also, greater economies may be realized if the teacher can learn and become competent in various skills of teaching by self-instructional methods.

However, little has been attempted in developing effective procedures for self-instruction and training in the skills of teaching. Previous studies have relegated the self-instructional procedures to "low-powered" control group status. The present study devises and tests various self-instructional procedures.

DEFINITIONS OF TERMS AND PROCEDURES

Feedback in this study refers to providing the teacher or trainee knowledge of his prior teacher performance via a video-tape recording of that performance.

Self-feedback refers to a teacher or trainee viewing a video-tape recording of his teaching performance alone without the direct assistance of a supervisor.

Contingent focus refers to the procedure of focusing a teacher or trainee's attention on the specific aspects of a teaching skill to be learned at the same time it occurs on video tape either in his own performance or a modeled performance. The focus can be provided by a supervisor in person or by prerecorded comments on the video tape.

Non-contingent focus also focuses the attention of the teacher on a skill but it does not occur simultaneously with each occurrence of the behavior on a video-taped performance. A non-contingent focus consists of a general description of the skill and its components followed by a directive to look for demonstrations of each in the teacher's own or a modeled performance. The focus is presented either by means of a written guide or video tape.

Modeled performance is a specific teaching skill (in this study, repetition and redundancy in lecturing) demonstrated and recorded on video tape. The "model" teacher prepares a five- to ten-minute lesson and demonstrates the skill(s) a maximum number of times and minimizes other skills.

Complete modeled performance refers to the procedure of demonstrating a specific teaching skill by teaching a complete lesson, usually short, to genuine students.

Specific illustrations model refers to demonstrating specific skills of teaching by a teacher standing before a camera and giving discrete examples of a skill. No students are used and the illustrations are not in the context of a lesson.

Symbolic modeling refers to the written instructions given to subjects during the training session. The instructions covered the educational relevance and gave a definition of the teaching skills serving as dependent variables in the study.

Informal lecture is a presentation mode in which the teacher presents information to students and only uses the latter as instruments of this presentation or questions them to determine their understanding. In other words, an informal lecture consists of 90 per cent teacher talk.

RELATED RESEARCH

In view of recent curricular developments which feature inductive teaching methods nearly to the exclusion of all other methods, it is near heresy to devote attention to teaching the novice teacher how to lecture. However, a review of the literature and research on teaching methods as they relate to learning indicates that lecturing is more effective than some methods in several studies and the reverse is true in others. In the final analysis, it appears that all methods are effective for certain learning tasks (Gage, 1963; McKeachie, 1967; Gage, 1967). For the purposes of this study, no further attention is given to establishing the

the efficacy of lecturing. The assumption is made that lecturing is a viable teaching method and that the novice teacher needs to learn how to lecture well.

An analysis of the lecturing act reveals that there are numerous components relating to content, its organization, and style of delivery. A single component of content organization has been selected for this study: literal repetition and the more comprehensive idea of redundancy were selected and became the dependent variables.

Use of Television Recordings in Teacher Education

Video-tape feedback--Acheson (1964) and Olivero (1964) studied the effectiveness of using television recordings as a supplement to and/or replacement for live observation. In both studies supervisory conferences using television recordings of the teachers' performances resulted in significantly greater change in teacher behavior than verbal feedback alone. Subsequent studies in the Stanford Teacher Education Program (McDonald et. al., 1966; Allen et. al., 1966; Orme, 1966) have shown similar results. One dissenting report is found in the literature. Schueler et. al. (1962) reported no significant differences with the use of television. However, the authors cite several reasons for the findings, among them the range of variation in the teaching situations.

Supervisory technique using television recordings--only a limited number of studies have been reported which relate to supervisory techniques using television recordings as a feedback tool to change teacher behavior.

A study by Acheson (1964) revealed no significant differences between directive versus heuristic non-directive styles of supervision during a critique using television recordings as a feedback medium.

The literature adequately substantiates the effectiveness of feedback in producing learning. Investigation has centered on reinforcement, knowledge of results, confirmation, and trial and error learning (Michael and Maccoby, 1960, 1961; Hilgard, 1956; Smith and Smith, 1966).

McDonald, Allen and Orme (1966) studied training effectiveness along a continuum from self-administered feedback or reinforcement to supervisor-administered reinforcement with cue discrimination training. The results indicate a clear progression of effectiveness along this continuum. Cue discrimination training was clearly effective as well as supervisor-administered feedback.

Teachers in the self-feedback condition studied a symbolic model on how to increase the frequency of the behavior in question. Limited behavior change was achieved but was relatively ineffective in comparison with other training procedures. Subsequent studies (Orme, 1966) revealed similar results.

The main purpose of this study is to determine the efficacy of self-feedback training procedures which provide the teacher with cues relative to the desired behavior.

Cueing, prompting and confirmation--prior studies on changing teacher behavior involving feedback and modeling have depended on a supervisor to provide prompts and confirmation by being present during the playback session or providing non-contingent prompts through written instructions.

The findings of Cook and Kendler (1956), Cook (1958), and Angell and Lumsdaine (1960) have confirmed the effectiveness of prompting in learning trials. Briggs (1961) in a summary of research studies concluded that the best training sequence probably is one in which prompting trials are used first followed by confirmation trials. McDonald, Allen and Orme (1966) cite the importance of focusing a trainee on salient cues during a playback of the trainee's own performance. Orme (1966) reported similar results when playing a modeled teaching performance.

In the present study, discrimination training such as that described above is provided via a commentary on the parallel sound track on both the modeled performance and the trainee's own performance. The commentary is contingent to the salient cue on which subsequent teacher behavior is to be attached. A visual prompting will also be incorporated into the modeled performance.

This procedure was originally reported as "remote supervision" (Allen and Young, 1966). An operational description of the procedure is available from the authors.

The efficacy of such a procedure is suggested by the literature on training films. Research has been conducted using animation to focus attention on specific aspects of material presented in training films. The results of this research indicate that such focusing techniques are effective (Lumsdaine, 1963).

Modeling--Bandura and Walter (1963) have shown that the availability of models portraying a behavior significantly influences behavior change. Bandura and McDonald (1963) also demonstrated that models are more effective in changing behavior than reinforcement alone.

A recent study by Orme (1966) resulted in significant behavior changes by intern teachers who had viewed a model as a training protocol. The most effective procedure consisted of a supervisor providing discrimination training while the tape was played.

A similar procedure is followed in the present study with the exception that the supervisor's discrimination training is provided by visual prompts and a verbal focus on the parallel sound track of the video tape.

It is established that mere exposure to a model will result in behavior change. However, a question exists as to the ability of a person to attend to all the relevant cues presented and to perceive them accurately. Sheffield and Maccoby (1961) found that if the distinctiveness of cues was increased, an increased level of learning resulted. In order to make the cues more distinctive, one can eliminate as many as possible of the competing stimuli. For example, to demonstrate a specific teaching skill, one could use a regular classroom recording. However, during the course of viewing a forty-minute classroom session the viewer would be exposed to many instances of competing stimuli and relatively few instances of the desired behavior. However, by scaling down the teaching encounter

in total time and increasing the incidence of the desired behavior, the number of competing stimuli have been reduced in proportion to the desired behavior. This should increase the probability of the viewer attending to the salient cues.

The present study attempts to further reduce the number of irrelevant cues by modeling the discrete teaching behaviors only. The modeled teaching skill will stand alone and be totally out of context of a lesson. Insofar as possible, the only teaching behavior demonstrated will be the desired criterion behavior of the trainee.

EXPERIMENTAL DESIGN AND PROCEDURE

The study was conducted during the 1967 Fall Quarter at Stanford University using teacher trainees in the intern phase of their preparation. Trainees teach two classes daily in nearby schools for one academic year.

Subjects

The subjects for this study were drawn from the 1966-1967 intern class in the secondary teacher education program at Stanford University. Interns in foreign language, music, physical education, and drama were excluded because lecturing is not common in these teaching fields in high school. The subjects in the other fields were randomly assigned to six experimental groups. Relevant characteristics of this sample appear in Table I..

Film and Video-Tape Models

Experienced teachers were selected to model the various teacher behaviors to be emphasized in the study.

The first step involved identifying and clarifying specific behavior(s) to be modeled. Once the specific teaching skills (repetition and redundancy) were identified, the teacher selected to model the skill prepared a ten-minute lecture emphasizing that specific skill.

Several groups of four students each, representative of students to be used in the experiment, were selected to serve as students for the modeled lectures. In order to preserve the spontaneity of each lecture, a new group of students was used each time the lecture was rehearsed. The models on control techniques and the film on discipline alternatives were exceptions to this practice inasmuch as the same group of pupils were used for each rehearsal and "shooting session."

Each trial model lecture was recorded on video tape and rated for frequency of skills and the saliency of the cues, until a maximal frequency of the behavior occurred and relevant cues were readily observed.

Model tapes were prepared in four disciplines: mathematics, science, English, and social studies.

The contingent focus (comments) were recorded on the video tape by using a microphone connected to the second sound track of a recorder which permitted the recording of sound without erasing the video portion. The relevant comment was recorded immediately preceding each behavior. Such comments as "note the analogy," "good example," or "note the metaphor" were recorded.

Visual prompts were provided by using a camera focused on a printed card and, in turn, by dubbing and the use of the electronic editing feature of the video recorder, it was incorporated into the modeled sequence.

The "specific illustration" models were recorded without students. The teacher modeled the specific skill by standing before the camera. A visual prompt was superimposed along the bottom of the screen using appropriate wording such as "cumulative repetition," "examples," et cetera.

General Procedure

The pretest consisted of a fifteen-minute recording of the intern's teaching performance in a conventional classroom setting. The day following the pretest recording, the interns returned to the university for a forty-five minute training

session. During the training session, the subject viewed a perceptual model and his own performance. The experimental sequence consisted of three video-tape recordings and two intervening training sessions.

The independent variables are described below. A summary of treatments by groups appears in Tables III and IV.

Independent Variables - Lecturing Skill of Redundancy

1. View a model demonstrating the lecturing skill of redundancy (varied repetition). The viewer is focused on each instance of varied repetition by comments contingent to the behavior with a verbal focus recorded on the second sound track.

   Examples of comments are: "Notice that the salient points were repeated," "This is the distributed repetition technique," or "This is an example of cumulative repetition," et cetera. A visual prompt is also used. A statement such as "use repetition in lectures" appears on the screen, and the verbal portion explains the skill which has just been used or is forthcoming. This model will be referred to as the "complete" model since it occurs in the context of a class situation.

   Subjects seeing the above model also see the "specific illustration" model.

2. View the same model performance without contingent comments but with a video-taped, non-contingent focus.

   The non-contingent focus consists of presenting to subjects specific methods of repetition and redundancy on the video tape prior to their viewing the model. Furthermore, he is requested to be observant of forthcoming instances of the skill in the model performance and to attempt to incorporate them into his teaching.

3. View a series of specific illustrations of each type of redundancy. These do not occur in a lesson context but are brief, discrete demonstrations of the specific teaching behaviors as they are introduced and explained by an announcer.
4. The subject views his own performance with contingent comments recorded on the second sound track. Following the recording of the subject's classroom performance, the experimenter viewed the tape and via the second sound track recorded comments designed to reinforce the subject for instances of the desired skill and to focus his attention on opportunities for incorporating additional repetition into subsequent lessons.
5. The subject views his own performance with a non-contingent focus recorded on video tape. The non-contingent focus consists of presenting to interns before, during, and after the viewing session a list of methods of redundancy, verbal comments reminding the subject to look for instances of same in his own performance and to determine where he can incorporate additional methods of repetition in his next lesson.

Collection of Data

All three classroom teaching sessions were recorded on video tape. Recordings were made using portable television recording units developed by the author (Allen and Young, 1966). These units consist of one camera with a zoom lens mounted on a small cart containing all the necessary components. One undergraduate operator rolls the unit to the rear of the classroom and is ready to record by the time class begins. Operators are instructed to keep the teacher in the picture at all times and close enough to observe gestures and the use of the chalkboard and/or other visual aids.

Several teams of raters were employed to code different categories of variables.

The lectures were fifteen minutes long and varied somewhat due to the more flexible classroom situation. In order to equalize all sessions, video tapes were timed with a stop watch. Concurrently, the amount of "teacher talk" was also determined by starting another watch when the teacher began talking and stopping it when a pupil began. The same group of raters also made a quantitative count of the number of times a teacher verbally emphasized a point. A cumulative counter was used to tally each occurrence.

Three criteria governed the rating of verbal emphasis: (1) the statement of word was louder than the average speech of the teacher; (2) it was spoken more slowly; (3) the syllables were enunciated more distinctly. Each tape was first played through to establish a baseline of volume by listening and watching the VU meter for extremes.

Three undergraduates were selected and trained for the above coding. Numerous non-experimental tapes were available and used during the training session. The data indicate that interrater reliability for verbal emphasis is below that for other behaviors but high enough to be included in the findings.

The remaining categories of redundancy were divided into verbal and non-verbal behaviors. The non-verbal behaviors were coded by viewing the video tapes. The verbal behaviors were coded from typed transcripts of the audio portion of the video tape. The transcript was considered essential for rating repetition in the longer teaching sessions inasmuch as the longer tapes increased the probability of a rater's forgetting what had been said throughout the lesson. With the transcript, the rater could repeatedly read the lecture until accuracy was assured.

Inasmuch as the data were composed of equal-interval scales, interrater reliability was determined by using the Pearson Product Moment Correlation coefficient (Scott, 1955). The reliability coefficients for the discrete categories are reported in Table V. As one can observe, the coefficients are quite high with the exception of the categories of congruent gestures and teacher

examples, both of which are difficult to define in objective terms and require more inference on the part of the rater. The higher reliability obtained on student examples is quite likely due to the raters' being cued by the teacher when he asked the student to give an example.

Analysis of Data

An analysis of covariance was performed on the data. The analysis was performed on each variable for session 2 and session 3 scores to test for significance of differences. The pretest (session 1) scores reflected substantial differences among groups; therefore, these scores were used as covariates for sessions 2 and 3 to adjust for the original levels of each group. All computations were performed using the general linear hypothesis program, BMD05V (Dixon, 1965) on an IBM 7090 computer in the Stanford University Computation Center.

The analysis yields F tests for row, column, and interaction effects. All F tests significant at the .25 level and above are reported.

Multiple comparison (simultaneous) tests were performed to determine which means were contributing the significance and to permit the ordering of means. Multiple comparisons permit any number of contrasts and resulting decisions to be made at the same probability of making a Type I error. The generality of the Bonferroni T Statistic makes it applicable to the data in this study. The Bonferroni statistic is only used when the F test is significant (Miller, 1966).

T tests are used to report trends where F tests and the Bonferroni T statistic yield no significant results. However, all decisions to reject the null hypothesis are made at the .05 level, and significance reported below this level and all T tests are for the purpose of determining trends only.

RESULTS

The results are summarized under two main "areas" of investigation.

1. Effectiveness of modeling protocols.
2. Effectiveness of viewing one's own performance with a contingent focus.

In general, the most effective modeling protocol is a combination of "specific illustrations" model and a "complete" model with a contingent focus. However, each modeling protocol appears to be more effective for training for a specific variable than for all variables in general.

The results of the study also give support to a contingent focus on a subject's own performance. Numerous significant differences were obtained, and the trend was consistently in the predicted direction.

THE EFFECTIVENESS OF MODELLING PROTOCOLS

Three modelling protocols (lecturing) were investigated:

1. "specific illustration" models.
2. combination of "specific illustration" and "complete" model with contingent focus.
3. "complete" model with non-contingent focus.

The effectiveness of these procedures is measured by comparing the pre-, mid-, and post-test performances on nineteen selected variables. The variables are listed below:

A. <u>Visual Highlighting</u>

   1. Diagrams
   2. Chalkboard Writing
   3. Underlining
   4. Focusing Gestures
   5. Congruent Gestures
   6. Visual Aids
   7. Total Visual Highlighting (Total of 1 through 6)

B. <u>Verbal Redundancy</u>

   1. Verbal Emphasis
   2. Teacher Examples

3. Student Examples
4. Total Teacher and Student Examples
5. Focusing Words
6. Analogies
7. Metaphors
8. Simple Repetition
9. Distributed Repetition
10. Massed Repetition
11. Cumulative Repetition
12. Total Verbal Means (Total of 1 through 11)

The various treatment groups are identified in Table VI. The ensuing discussion will focus on the combination of variables such as total visual highlighting, total examples, and total verbal redundancy. Detail discussion of each variable appears in the author's dissertation.

"Specific Illustration" Model

Subjects viewing the "specific illustration" model used a significantly greater number of teacher literal repetitions, but other differences failed to reach significant levels. Therefore, the hypothesis must be rejected. The trends indicate that the unambiguous nature of the "specific illustration" model was more suitable for the more complex verbal teaching skills.

The data in Table VII give little support to the "specific illustration" model. The scores for the total of all verbal variables, session 3, and the variable, verbal emphasis, both sessions, indicate that the "specific illustration" model is a more effective protocol for training interns in these skills. The level of significance is T.10 and B.25 respectively.

An inspection of column means (Table VIII) reveals that several other variables show larger column mean scores for the "specific illustration" model, namely, teacher examples, percent teacher talk, visual aids, and diagrams, session 2.

Combination of "Specific Illustration" and "Complete" Video-Tape Models with Contingent Focus

The combination of the model with contingent focus (C.F.) and the "specific illustration" model is superior to the same model with a non-contingent focus and "specific illustration" at the F.05 level for the total of all visual highlighting variables in the third session. See Table VII.

The strong visual highlighting effects may be due to the fact that the range of examples given in the "specific illustration" model is limited. The "complete" model offers a greater number of examples which are pointed out for the subject.

Only a few of the visual highlighting variables taken separately reached significant levels, but mean differences for all variables were in the predicted direction. See Table VII.

Subjects viewing the combination also secured significantly more student examples than subjects in column 1 at the .05 level. In the latter case, it was not significantly greater than column 3. The hypothesis can not be accepted, but the reader will note that the general trend is in the predicted direction for all variables with the exception of a few verbal variables.

THE EFFECTIVENESS OF A CONTINGENT FOCUS ON THE SUBJECT'S OWN PERFORMANCE

The hypothesis stated, "Viewing one's own performance with a contingent focus is more effective than with a non-contingent focus." Although the data in Table IX strongly support the hypothesis, it can not be accepted for all variables. The F ratio was significant at the .05 level for visual aids, session 3; total visual highlighting, session 3; student examples, session 2 and session 3; total examples, session 2; and total verbal redundancy, session 3.

Although only the significant differences are reported above, nearly all means for rows verify the effectiveness of the contingent focus. See Table X.

Initial hypotheses suggest that a combination treatment of viewing the "specific illustration" and the "complete" model with contingent focus and viewing one's own performance with a contingent focus would be most effective.

Tests of significance reported in Table XI support this prediction. Total visual highlighting, session 3, student examples, and total teacher and student examples are significant at the .05 level.

All group means are ordered by session in Table XII. A survey of the ordered means substantiates the predicted trend. The mean for Group II is ranked first for approximately half of all variables and second in a number of other instances.

It is interesting to note that the mean for the group viewing the "specific illustration" model and viewing their own performance with contingent focus (Group I) was the largest for such "complex" variables--analogy, metaphor, teacher examples (B.05) and total verbal redundancy.

A reverse pattern is revealed for the variable, percentage of teacher talk. See Profile I. Group VI does not show the extreme increases on this variable. In session 3, row 2 was significantly larger than row 1 at the F.05 level. A decline would be necessary in order to increase the frequency of several variables, namely, student examples and visual highlighting.

PROFILE OF MEAN DIFFERENCES

The foregoing discussion has been limited to the differences in group means. The direction or amount of change from session to session for each variable is shown by profiles of mean differences. The profile for the variable, total visual highlighting, is displayed in Profile 2. The mean for Group VI shows a marked increase from session 1 to session 2 and again from session 2 to session 3. Group VI subjects viewed both the "complete" model and their own performance with a non-contingent focus. Group IV exhibits a different pattern, an increase in session 2 but a sharp decline in session 3.

A somewhat different pattern is shown for total teacher and student examples (Profile 3). Group II makes a sharp increase, session 2, but declines to a level below session 1 in session 3. All other means are at lower levels in session 3 than they were in session 1.

The pattern of change is nearly identical for total verbal redundancy, Profile 4, with the exception that Group I shows a sharper increase from session 1 to session 2.

Groups I and II are consistently above session 1 levels on subsequent trials and normally reflect a positive change.

The fluctuations of declines and increases on other group means suggest that there is an interaction between the model as a person, the subject, the intensity with which the teaching skill is demonstrated, and the nature of the variable.

It should be noted that throughout the study the teaching skill was referred to as redundancy. It is quite likely that in the absence of a contingent focus or discrimination training, trainees, aware of negative connotations attached to the term, thought they were viewing a negative model. (Negative models have been used in prior training although with other groups.) This could account for the decreases for certain treatment groups.

IMPLICATIONS FOR TEACHER EDUCATION

The results of this study provide support for the following recommendations:

1. Teacher candidates should be provided the opportunity to view videotape models of specific teaching behavior. In order to assure that trainees observe the desired skills, a focus, contingent to the desired behavior, should be recorded on a second sound track. Modelling protocols should be adapted to the skill being modeled.

2. "Remote supervision" should be employed to increase the frequency of supervision especially when logistics limit the frequency of visits. When

teacher candidates are placed in distant schools for student teaching or internships, video tapes of their performances should be forwarded to the university for a critique. The supervisory comments (contingent focus) should be recorded on the second sound track and returned to the candidate for his review.

Suggestions for Further Research

The results of this study suggest that a contingent focus on a model or subject's own performance is more effective than a non-contingent on each.

Prior studies (Orme, 1966) have shown that a supervisor in person is more effective than a subject viewing a model or his own performance alone. Therefore, this question still remains unanswered. Is a supervisor in person more effective than a contingent focus for self-viewing?

An experiment should be designed to test the relative effectiveness of each.

A review of the standard deviations on the lecturing variables reveals considerable variation. This variation suggests that the "type" of lecture varied from day to day. Likewise, the potential for using varied repetition also fluctuated from session to session. Given the situation of a classroom setting, one can control the students since they remain the same. However, little control can be effected for the lecture content.

Therefore, the study should be replicated with the lecture content controlled but the students changed from session to session. The micro-teaching format is recommended.

It should also be replicated to determine the effectiveness of each modelling protocol alone. Since the model with contingent focus was combined with the "specific illustration" model, one can not determine the effectiveness of it alone. Subsequent studies should use a greater number of subjects to allow for the necessary increase in treatment groups.

One result is quite clear. The effectiveness of modelling protocols varies with the nature of the dependent variable. That is, one type of model may be more effective for teaching subjects to use one specific teaching skill than another type of model would be. It is also suggested that for some skills a symbolic model may suffice.

An extensive series of experiments should be devised to determine which modelling protocols are most effective for teaching each of the various skills.

The relative effectiveness of teaching skills needs to be assessed in terms of student learning and perceptions. For example, in the present study the degree of redundancy may be critical and what the teacher perceives as necessary redundancy for learning may be viewed by the student as unnecessary and, consequently, will achieve negative results.

*Research conducted while at the Stanford University Center for Research and Development on Teaching with Dwight W. Allen, Frederick J. McDonald and Robert N. Bush.

TABLE I

CHARACTERISTICS OF SUBJECTS BY TREATMENT GROUPS

Group	Number	Age	Sex M	Sex F	Grade Point Avg.	G.R.E. Verbal Score	Quantitative Score	Art	English	Mathematics	Science	Social Studies
1	18	23.1	4	14	3.09	623	515	1	6	1	1	9
2	16	23.9	6	10	2.93	590	525	0	6	1	1	8
3	15	22.4	5	10	3.05	612	608	0	3	2	2	8
4	14	22.3	3	11	3.07	608	564	0	5	2	3	4
5	14	21.7	2	12	3.01	581	565	1	3	3	2	5
6	17	22.0	4	13	3.09	665	603	1	6	2	3	5

TABLE III

SUMMARY OF TREATMENTS BY EXPERIMENTAL GROUP

Treatment	Group 1	2	3	4	5	6
Pretest - classroom recording	X	X	X	X	X	X
View specific illustration - model A	X			X		
View "complete" model A with contingent focus	X	X		X	X	
View "complete" model A with non-contingent focus			X			X
View self with contingent focus	X	X	X			
View self with non-contingent focus				X	X	X
Post test (1) classroom recording	X	X	X	X	X	X
View specific illustrations - model B	X			X		
View "complete" model B with contingent focus	X	X		X	X	
View "complete" model B with non-contingent focus			X			X
View self with contingent focus	X	X	X			
View self with non-contingent focus				X	X	X
Post test (2) classroom recording	X	X	X	X	X	X

TABLE IV

EXPERIMENTAL DESIGN

	Specific Illustrations	Illustrations & Model w/Focus	Model w/Non Contingent Focus
View Self with Contingent Focus	Classroom Recording I View Illustrations I View Self w/Contingent focus Classroom Recording II View Illustrations II View Self w/Contingent focus Classroom Recording III	Classroom Recording I View Illustrations I View Model I w/Contingent focus View Self w/Contingent focus Classroom Recording II View Illustrations II View Model II w/Contingent focus View Self w/Contingent focus Classroom Recording III	Classroom Recording I View Model I w/Non-Contingent focus View Self w/Contingent focus Classroom Recording II View Model II w/Non-Contingent focus View Self w/Contingent focus Classroom Recording III
View Self with Non-Contingent Focus	Classroom Recording I View Illustrations I View Self w/Non-Contingent focus (written) Classroom Recording II View Illustrations II View Self w/Non-Contingent focus Classroom Recording III	Classroom Recording I View Illustrations I View Model I w/Contingent focus View Self w/Non-Contingent focus Classroom Recording II View Illustrations II View Model II w/Contingent focus View Self w/Non-Contingent focus Classroom Recording III	Classroom Recording I View Model I w/Non-Contingent focus Classroom Recording II View Model II w/Non-Contingent focus View Self w/Non-Contingent focus Classroom Recording III

TABLE V

INTERRATER RELIABILITY

Variable	Coefficient of Correlation AB	AC	BC
Verbal Emphasis	.771	.889	.828
Teacher Examples	.881	.956	.793
Student Examples	.971	.965	.898
Focusing Words	.937	.918	.959
Analogy	.974	.990	.952
Metaphor	.875	.895	.971
Focusing on Chalkboard	.993	.993	.985
Congruent Gestures	.785	.894	.892
Writing	.997	.999	.999
Underlining	.986	.975	.975
Diagrams	.999	.999	.999
Visual Aids	.995	.998	.993
Simple Repetition	.971	*	*
Distributed Repetition	.938	*	*
Massed Repetition	.810	*	*
Cumulative Repetition	.998	*	*

* Only one pair of raters

TABLE VI

IDENTIFICATION OF EXPERIMENTAL GROUPS
BY TREATMENT

Treatment	View "Specific Illustration"	View "Specific Illustration" and "Complete" Model with Contingent Focus	View "Complete" Model with Non-Contingent Focus
View own performance with Contingent Focus	GROUP I	GROUP II	GROUP III
View own performance with Non-Contingent Focus	GROUP IV	GROUP V	GROUP VI

TABLE VII

SUMMARY OF SIGNIFICANT COLUMN DIFFERENCES
F RATIOS, BONFERRONI STATISTIC, T TESTS

	Session 2		Session 3	
	F	Test	F	Test
Diagrams	NS	NS	NS	2>1 (T.10)
Writing	.25	2>3 (B.25)	.01	2>3 (B.10)
Underlining	NS	NS	NS	2>1 (T.10)
Focusing	NS	NS	NS	NS
Congruent Gestures	NS	NS	NS	2>3 (T.10)
Visual Aids	NS	NS	NS	NS
Total Visual Highlighting	NS	2>3 (T.10)	.05	2>3,1 (B.05)
Teacher Examples	NS	NS	NS	1>3 (T.10)
Student Examples	.05	2>1 (B.05)	NS	NS
Total Examples	NS	NS	NS	NS
Focusing Words	NS	NS	NS	NS
Analogies	NS	NS	NS	NS
Metaphor	NS	NS	NS	NS
Simple Repetition	NS	2>1 (T.10)	.10	1>3 (B.05) 1>2 (B.10)
Distributed Repetition	NS	NS	NS	NS
Massed Repetition	NS	NS	.25	3>2 (B.25) 3>1 (T.10)
Cumulative Repetition	NS	NS	NS	NS
Total Verbal Redundancy	NS	2>1 (T.025)	NS	1>3, 2>3 at (T.10)
Verbal Emphasis	.10	1>2, 3 (B.10)	.25	1>3 (B.25)
Percent Teacher Talk	NS	NS	NS	NS

TABLE VIII

COMPARISON OF COLUMN MEANS

	Session 2			Session 3		
	Col.1	Col.2	Col.3	Col.1	Col.2	Col.3
Diagrams	2.59	2.20	1.79	.86	2.04	1.21
Writing	11.02	12.59	8.52	10.31	18.31	9.76
Underlining	4.04	3.93	4.72	3.27	4.99	4.49
Focusing	13.86	15.52	13.52	10.91	15.13	13.18
Congruent Gestures	1.39	1.39	1.93	1.42	2.45	1.26
Visual Aids	2.51	2.28	2.44	3.00	4.04	3.77
Total Visual Highlighting	35.69	37.64	30.18	27.57	45.90	30.08
Teacher Examples	21.12	21.93	20.10	24.64	20.77	18.10
Student Examples	2.47	6.56	5.40	5.10	6.58	4.60
Teacher & Student Examples	22.57	26.89	23.20	25.50	26.58	22.14
Focusing Words	7.78	9.54	8.92	7.94	8.32	5.56
Analogies	.46	.34	.40	.43	.29	.19
Metaphors	.12	.12	.13	.50	.33	.06
Simple Repetition	7.38	9.57	8.26	10.80	7.73	7.04
Distributed Repetition	6.57	6.48	6.44	6.42	6.91	5.46
Massed Repetition	.85	.80	1.63	1.07	.80	5.28
Cumulative Repetition	.03	.19	.67	.39	.31	.58
Total Verbal Redundancy	46.90	54.20	49.80	53.82	51.38	43.54
Verbal Emphasis	6.77	4.26	4.18	7.60	5.53	4.65
Percent Teacher Talk	86.22	82.87	85.11	84.98	84.71	81.50

TABLE IX

SUMMARY OF SIGNIFICANT ROW DIFFERENCES--F RATIOS, BONFERRONI STATISTIC, T TESTS

	Session 2		Session 3	
	F	Test	F	Test
Diagrams	NS	NS	NS	1> 2 (T.10)
Writing	NS	NS	NS	NS
Underlining	NS	NS	NS	NS
Focusing Gestures	.10	1> 2 (B.10)	NS	NS
Congruent Gestures	NS	NS	.25	1> 2 (B.25)
Visual Aids	.25	2> 1 (B.25)	.05	1> 2 (B.05)
Total Visual Highlighting	NS	NS	.05	1> 2 (B.05)
Teacher Examples	.05	1> 2 (B.05)	NS	NS
Student Examples	.05	1> 2 (B.05)	.05	1> 2 (B.05)
Total Examples	.05	1> 2 (B.05)	NS	NS
Focusing Words	NS	NS	NS	NS
Analogies	NS	NS	NS	NS
Metaphors	NS	NS	NS	NS
Simple Repetition	NS	2 > 1 (T.05)	.10	1> 2 (B.10)
Distributed Repetition	NS	NS	NS	NS
Massed Repetition	NS	1> 2 (T.10)	.25	1 > 2 (T.10)
Cumulative Repetition	NS	1> 2 (T.05)	NS	NS
Total Verbal Redundancy	.10	1> 2 (B.10)	.05	1> 2 (B.05)
Verbal Emphasis	NS	NS	.25	2> 1 (B.25)
Percent Teacher Talk	.10	2> 1 (B.10)	.10	2> 1 (B.10)

TABLE X

COMPARISON OF ROW MEANS

	Session 2		Session 3	
	Row 1	Row 2	Row 1	Row 2
Diagrams	2.51	1.79	1.67	1.07
Writing	9.84	11.40	12.19	13.14
Underlining	4.32	4.10	4.56	3.81
Focusing	15.76	12.62	13.89	13.24
Congruent Gestures	1.77	1.33	2.12	1.29
Visual Aids	1.69	3.27	5.51	1.58
Total Visual Highlighting	36.00	32.83	29.98	28.12
Teacher Examples	24.30	17.42	23.50	19.10
Student Examples	5.95	3.57	6.99	3.79
Teacher & Student Examples	27.89	20.08	27.11	22.45
Focusing Words	8.02	9.71	6.96	7.76
Analogies	.48	.37	.37	.27
Metaphors	.12	.12	.16	.45
Simple Repetition	8.26	8.27	9.90	7.35
Distributed Repetition	6.82	6.15	6.32	6.26
Massed Repetition	1.56	.73	3.80	1.00
Cumulative Repetition	.52	.04	.37	.48
Total Verbal Redundancy	54.37	45.82	54.95	44.38
Verbal Emphasis	4.78	5.66	5.08	6.95
Percent Teacher Talk	82.50	87.10	81.30	84.98

TABLE XI

SUMMARY OF SIGNIFICANT GROUP DIFFERENCES AS DETERMINED BY THE F RATIO, BONFERRONI STATISTIC, AND T TESTS

	Session 2		Session 3	
	F	Test of Significance	F	Test of Significance
Diagrams	NS	NS	NS	2>4 (T.10)
Writing	NS	NS	.05	2>3 (B.05) 2>1,4 (B.10)
Underlining	NS	NS	NS	4>2 (T.05) 4>5,6 (T.10)
Focusing	NS	2>4 (T.10)	NS	5>1 (T.10)
Congruent Gestures	.25	3>1,2,4,5,6 (B.05)	NS	3,4>6 (B.05)
Visual Aids	NS	6>1 (T.05)	NS	2>5 (T.05) 2>4 (T.10)
Total Visual Highlighting	NS	2>6 (T.10)	.05	2>4,6 (B.01) 2>1 (B.10)
Teacher Examples	.01	2>5 (T.01)	.25	1>3,5 (B.05) 2>3, 1>4,6 (T.10)
Student Examples	.01	2>1,4,5 (B.05) 2>3 (B.10)	NS	1,2>4 (T.025) 1,2>6 (T.05) 3>4 (T.10)
Teacher & Student Examples	.05	2>5 (B.05) 2>3,4 (B.10)	NS	NS
Focusing Words	NS	NS	NS	1,2>3 (T.05) 4,5,6>3 (T.10)
Analogies	.10	2>3 (T.10)	.25	2>5 (T.025) 3>5 (T.01) 1,6>5 (T.10) 2,3>1 (T.05)

TABLE XI, continued

	Session 2		Session 3	
	F	Test of Significance	F	Test of Significance
Metaphors	NS	1 > 3,5,6 (T.10)	NS	NS
Simple Repetition	.25	2 > 1 (B.25) 3,4 > 1, 2 > 6 (T.10)	NS	1,4 > 6 (B.05) 3 > 6 (B.10) 1 > 5 (B.25) 2 > 6 (T.10)
Distributed Repetition	.25	3 > 5,6 4 > 1,5, & 6 (T.10)	NS	1,2 > 3 (T.10)
Massed Repetition	NS	3 > 2,4,6 (T.025) 3 > 1,5 (T.10)	NS	3 > 4 (T.005) 3 > 1,2,4,5,6 at (T.01)
Cumulative Repetition	NS	3 > 1,4,5,6 (T.05) 3 > 2 (T.10)	.05	3 > 1 (B.25) 3 > 6,2 (T.05) 3 > 5, 4 > 1,6 at (T.10)
Total Verbal Redundancy	.10	2 > 5,1,4 (B.10) 2 > 6 (B.25) 2 > 3 (T.05)	NS	1 > 6 (T.005) 2,3 > 6 (T.01) 4 > 6, 1 > 5 at (T.10)
Verbal Emphasis	NS	4 > 3 (T.10)	NS	4 > 3. (T.01)

TABLE XII

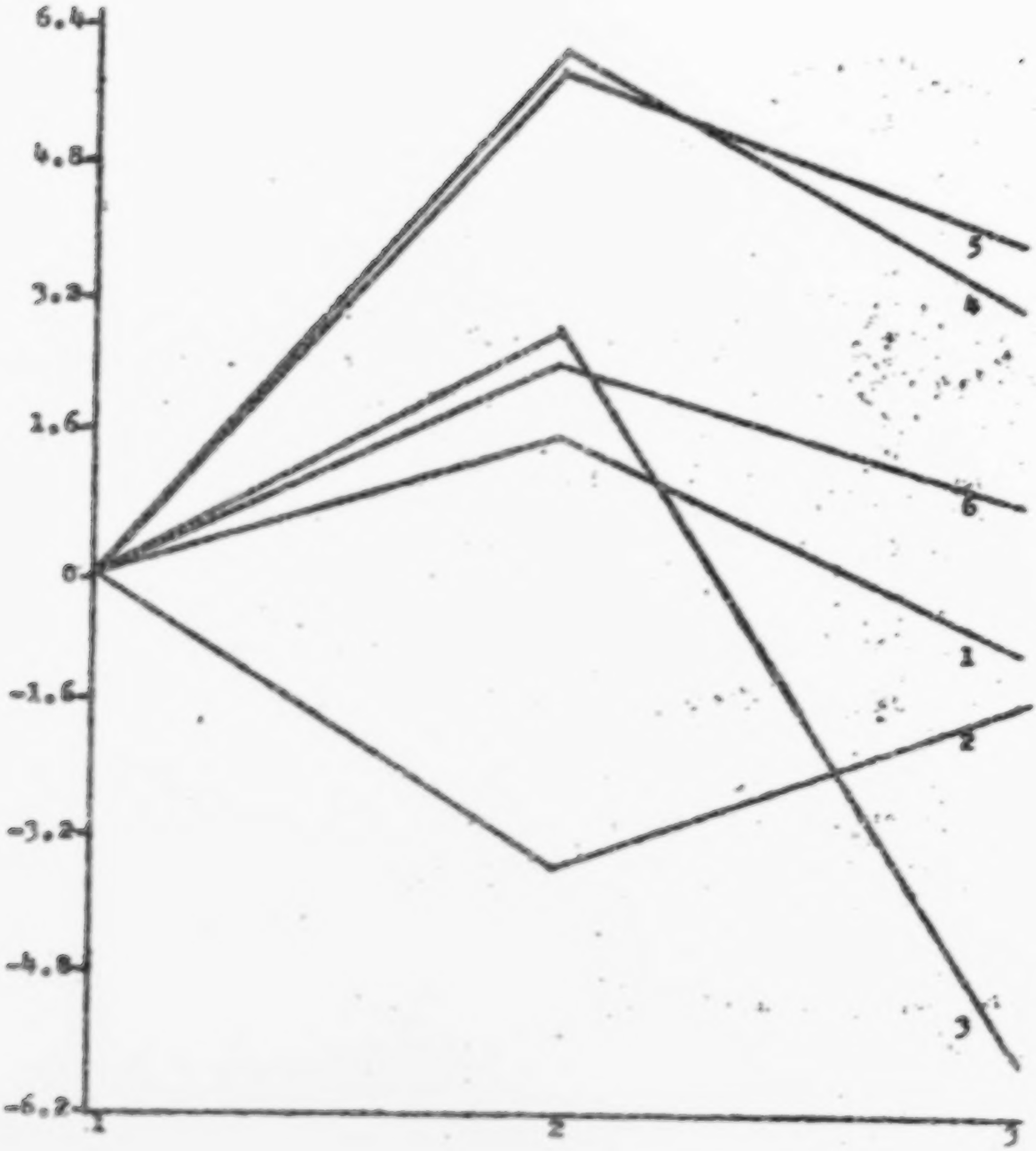
ORDER OF GROUP MEANS

	Session 2	Session 3
Diagrams	2, 4, 1, 3, 5, 6	2, 5, 3, 6, 1, 4
Writing	5, 4, 2, 1, 6, 3	2, 5, 4, 1, 4, 3
Underlining	6, 1, 3, 2, 5, 4	2, 6, 5, 1, 3, 4
Focusing	2, 1, 3, 6, 4, 5	5, 3, 2, 4, 6, 1
Congruent Gestures	3, 4, 5, 2, 1, 6	2, 3, 5, 4, 1, 6
Visual Aids	6, 4, 2, 5, 1, 3	2, 3, 1, 6, 4, 5
Total Visual Highlighting	2, 5, 1, 4, 3, 6	2, 5, 3, 1, 6, 4
Teacher Example	2, 1, 3, 6, 4, 5	1, 2, 6, 4, 5, 3
Student Example	2, 6, 3, 1, 5, 4	2, 1, 3, 5, 6, 4
Teacher & Student Example	2, 6, 1, 3, 4, 5	2, 1, 4, 6, 5, 3
Focusing	5, 6, 3, 1, 4, 2	2, 4, 5, 1, 6, 3
Analogies	2, 4, 1, 6, 3, 5	4, 3, 2, 6, 1, 5
Metaphor	4, 3, 2, 5, 6, 1	1, 2, 4, 6, 5, 3
Student Repetition	2, 3, 4, 5, 6, 1	1, 4, 3, 2, 5, 6
Distributed Repetition	4, 3, 2, 1, 6, 5	5, 1, 2, 6, 5, 3
Massed Repetition	3, 1, 5, 2, 4, 6	3, 1, 6, 5, 4, 2
Cumulative Repetition	3, 2, 5, 6, 1, 4	3, 4, 5, 2, 6, 1
Total Verbal Redundancy	2, 3, 6, 3, 1, 5	1, 2, 3, 4, 5, 6
Verbal Emphasis	4, 1, 6, 5, 2, 3	4, 1, 5, 6, 2, 1

PROFILE 1

PROFILE OF ADJUSTED MEAN DIFFERENCES
FROM SESSION 1 TO SESSION 2 AND
FROM SESSION 1 TO SESSION 3
BY EXPERIMENTAL GROUPS

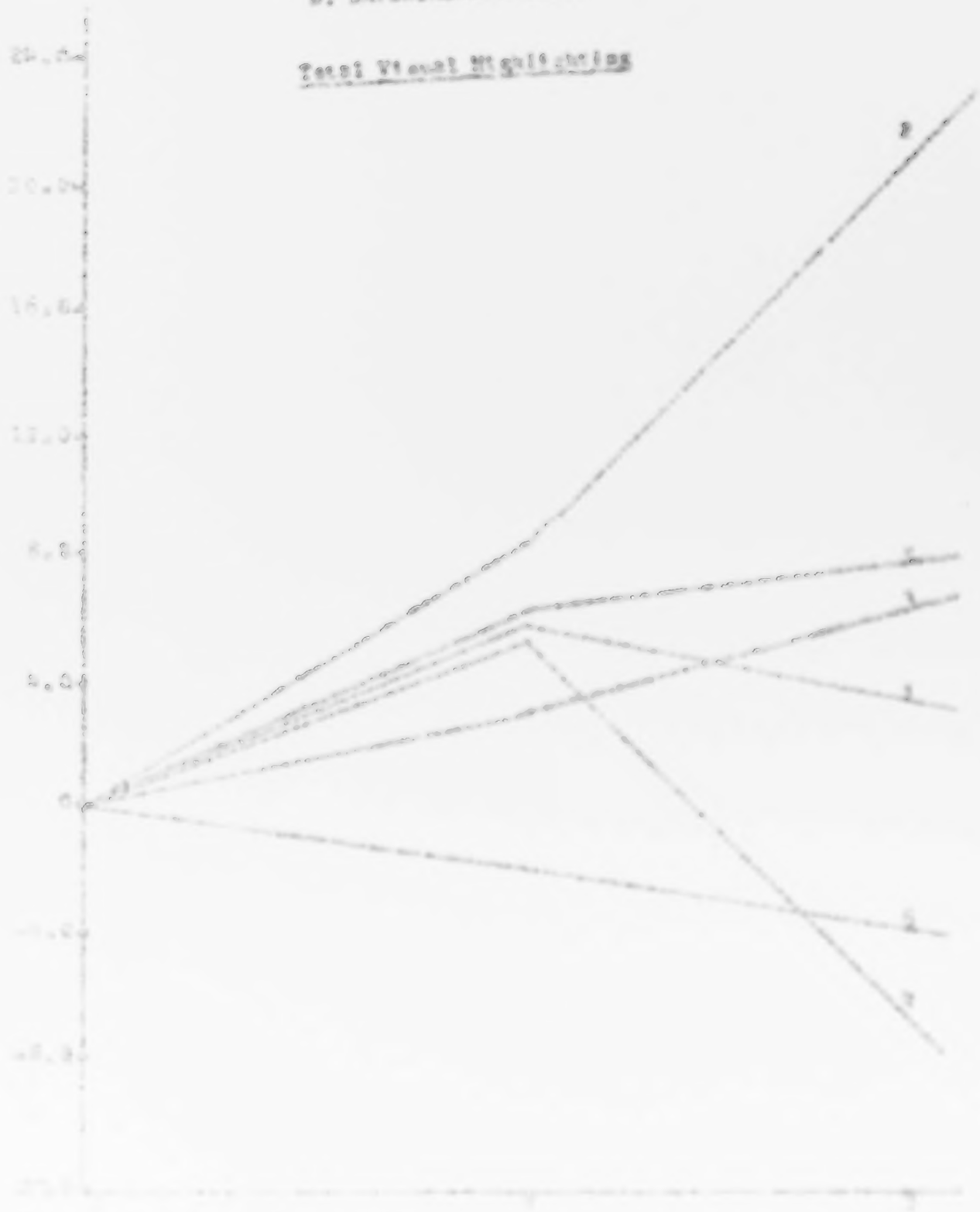
Percentage of Teacher Talk



PROFILE 2

PROFILE OF ADJUSTED MEAN DIFFERENCES
FROM SESSION 1 TO SESSION 2 AND
FROM SESSION 1 TO SESSION 3
BY EXPERIMENTAL GROUP

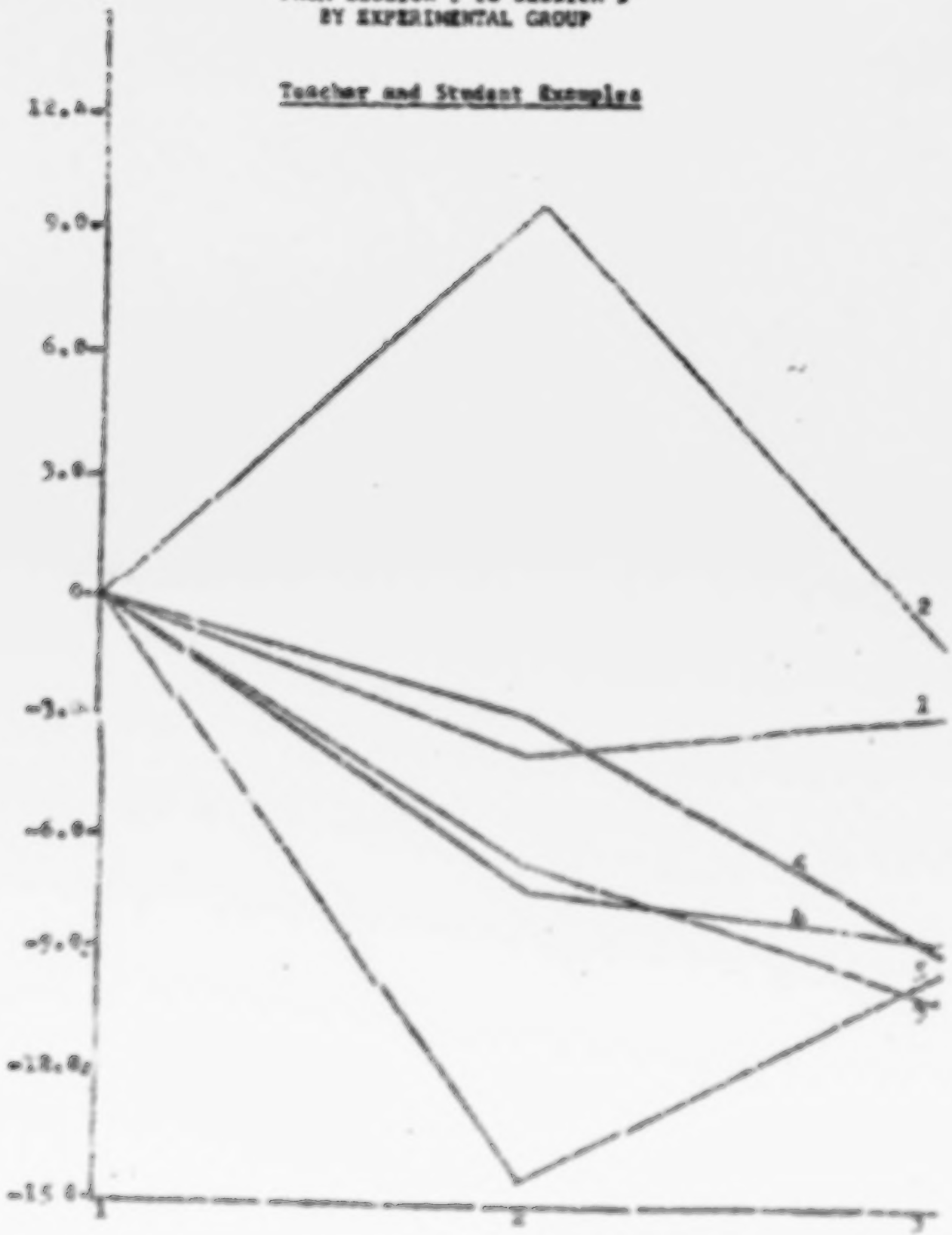
Total Visual Hallucinations



PROFILE 3

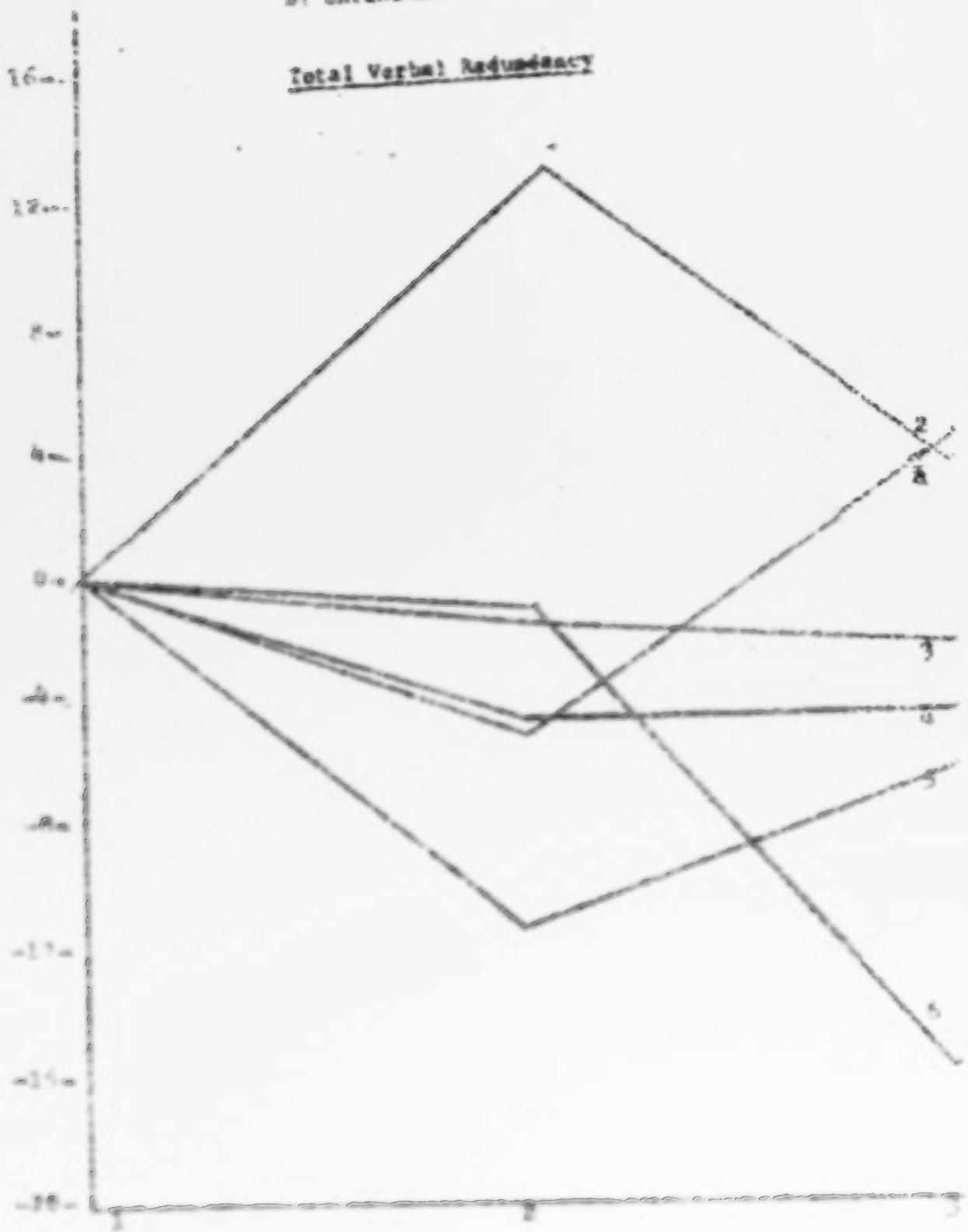
PROFILE OF ADJUSTED MEAN DIFFERENCES
FROM SESSION 1 TO SESSION 2 AND
FROM SESSION 1 TO SESSION 3
BY EXPERIMENTAL GROUP

Teacher and Student Examples



PROFILE 4

PROFILE OF ADJUSTED MEAN DIFFERENCES
FROM SESSION 1 TO SESSION 2 AND
FROM SESSION 1 TO SESSION 3
BY EXPERIMENTAL GROUP



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WASHINGTON, D. C. 20006